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THE

ONTARIO WATER RESOURCES COMMISSION

TOWNSHIP OF BRANTFORD

CONTAMINATION OF THE BRANTFORD AIRPORT MUNICIPAL WELL WITH OIL

R. J. Patterson

1972

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Township of Brantford :
contamination of the Brantford
airport municipal well with oil /
Patterson, R.J.
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TOWNSHIP OF BRANTFORD
CONTAMINATION OF THE BRANTFORD AIRPORT MUNICIPAL WELL WITH OIL

INTRODUCTION

On October 28, 1971, Mr. R. McMurray, Division of Sanitary Engineering, requested that the Division of Water Resources investigate the presence of oil in the Brantford Airport municipal well which is operated by the Township of Brantford.

On October 29, and November 8, 1971, Mr. R. Patterson, Surveys and Projects Branch, visited the site, collected water samples for chemical analyses and discussed the situation with municipal officials and local industries.

Background

During the Second World War, the Department of National Defence maintained a large airfield a few miles west of the city of Brantford. After the war, the airfield was abandoned and all associated housing was removed. Several of the large hangars were converted to factories and a small portion of the airfield was retained to serve as the Brantford Municipal Airport.

In 1967, the Township of Brantford installed a municipal water well on the airport property near Highway 53. The well is 113 feet deep, is screened from 96½ to 112 feet and has a capacity of 350 Igpm. The original static water level in the well was 54 feet, 7½ inches with a pumping level of

60 feet, 8¼ inches.

The well presently supplies 8 commercial concerns, 1 store and about 90 houses. Water from the well is chlorinated before entering a 125,000-gallon reservoir which is divided into four chambers by baffles suspended from the reservoir roof.

In late October, a layer of oil was noticed on the surface of the water in the first chamber of the reservoir, and the water from the well was observed to contain minor quantities of oil. Further inspection revealed that only trace amounts of oil had reached the fourth reservoir chamber as the system of baffles within the reservoir had been effectively trapping the oil on the water surface, mainly in the first chamber. As a result, oil has not entered the distribution system.

No objectionable odours or tastes were detected in the water, either before or after chlorination.

FIELD INVESTIGATION

Figure 1 illustrates the location of the municipal well and the various industries at the airport site.

On October 29, 1971, about 10 gallons of oil had accumulated on the water surface in the first chamber of the reservoir. The length of time during which this oil had accumulated could not be determined precisely because the reservoir had not been inspected since July, 1971. The oil was removed with a skimming pump. During the field investigation, it was suggested that an existing overflow pipe in the first chamber be opened and permitted to discharge to a container. By means of this overflow system, it was felt that the oil could be selectively removed and retained for disposal.

Samples of oil and water were collected from the airport well and, for comparison, water samples were collected from other nearby wells. No other wells have, as yet, experienced any oil contamination, but all of the owners were alerted to the possibility and were instructed to report any problems to the Township of Brantford.

All of the companies located near the airport well were contacted to ascertain the source of the oil. Only two potential sources were evident: York Farms Canning Company discards small quantities of used motor oil on the surface of the ground south of their plant, and Ruff Clarkson Steel Company discharges a few gallons of oil emulsion dip every two weeks into a storm sewer catch basin located south of their buildings. This latter practice has been carried out for about 20 years. Neutralized sulphuric acid pickling fluids are similarly, but more frequently, discharged to the sewer by Ruff Clarkson. At the time of the investigation, both companies agreed to terminate their discharges of oil. Fresh samples of each type of oil were collected for infrared and fluorospectroscopic comparison with the oil contaminating the airport well.

On November 8, 1971, Mr. P. Fischer, Division of Industrial Wastes, accompanied Mr. R. Patterson on a second visit to the area. A second set of oil samples were obtained from Ruff Clarkson Steel Company, York Farms Canning Company and the airport well. As well, some of the many sewer outfalls that surround the area were sampled.

At the time of the second visit, the overflow pipe in the first chamber of the reservoir had been uncovered and was discharging to a series of barrels. About two gallons of oil per week were being collected in the barrels. Although the system was effectively removing the oil from the reservoir, concern was expressed that freezing would cause a problem in the winter.

Inquiries regarding the storm sewer network beneath the airport revealed that it was not completely understood by either the township or the industries using it. The complexity results from the superposition of several newer sewer systems on the original storm and sanitary sewer systems which served the airfield. Later construction of new buildings added to the confusion by causing sewer blockages and diversions.

Mr. P.Fischer returned to the site on November 12, 1971, and attempted to trace the course of discharges from the various companies. This investigation did not illuminate all the intricacies of the system, but indicated that effluent from the Ruff Clarkson Steel Company probably has gained access to the ground water through a leak in the sewer between points C and D in Figure 1. Between these two points there is a marked decrease in the volume of flow.

All of the sewers are badly corroded, possibly as a result of incompletely neutralized pickling acid discharge. Mr. P.Fischer reported that a more thorough investigation of the sewer system and of the industries will be undertaken by the Division of Industrial Wastes.

HYDROGEOLOGY

The airport is situated on a physiographic feature known as the Norfolk Sand Plain. The overburden sediments comprise fine-to-medium-grained sands and gravels of deltaic and glacio-fluvial origin that, according to the driller's record for the municipal well, extend to a depth of 113 feet. Lenses of clay reportedly occur within the upper 45 feet of the overburden.

In addition to the municipal well, there are four other large-capacity wells which draw supplies from this aquifer. These are owned by York Farms Canning Company and are utilized during periods of peak production. The locations of these wells are shown in Figure 1.

The sand plain forms a ground-water recharge area. The natural direction of ground-water flow is probably northeastward toward the Grand River. However, the natural direction of flow would likely be altered near the high-capacity municipal well which would have a large pumping cone of capture. Polluting substances spilled within the area of capture would move against the prevailing ground-water gradient toward the well. The sedimentary section is permeable and the aquifer in this area is highly susceptible to contamination from surface spills or discharges.

CHEMICAL QUALITY

Table 1 lists the analytical results for the water samples. These results indicate that the chemistry of the water from the airport well is typical for the area. It should be noted that the sulphate concentration is not unusually high, indicating that discharged pickling fluid is not reaching the well, at least without considerable dilution. An ether extraction revealed that the water in the reservoir beneath the oil slick contains less than 1 ppm of oil. The relatively high chloride concentration in the shallow, 20-foot deep dug well, well No. 3, is thought to be due to the application of road salt on Highway 53.

Fresh oil samples from the Ruff Clarkson Steel Company and York Farms Canning Company were compared with the oil from the airport municipal well by means of infrared absorption and fluorospectroscopy. All of the oils can be classified as light paraffinic lubricating oils. The infrared absorption trace for the oil from the airport well is very similar to that from the Ruff Clarkson Steel Company, however, fluorospectroscopic analysis revealed differences. On the basis of the fluorospectroscopic results, the oil from the airport well was judged to have undergone some degradation, probably as a result of its passage through the ground to the well. Although this degradation may be responsible for the apparent differences between the oil from the Ruff Clarkson Steel Company and that obtained from the well, it cannot be stated conclusively that the two oils are identical. Similarly, a positive comparison of the oils from the sewer outfalls and the fresh oils from the Ruff Clarkson Steel Company and York Farms was not possible because of degradation.

CONCLUSIONS

The airport municipal well obtains supplies from an unconfined sand and gravel aquifer which is highly susceptible to contamination from surface spills or discharges. The municipal well has been contaminated by a light lubricating oil but a significant concentration of the contaminant has not gained access to the distribution system because the storage reservoir has acted as a separator.

Two possible sources of the contaminant were identified in the field, namely, oil discharges from the Ruff Clarkson Steel Company and from York Farms Canning Company. Laboratory analyses did not conclusively indicate the source of the oil in the airport well. However, of the two possible sources, the Ruff Clarkson Steel Company discharge seems to be the most likely. If the source is near the York Farms operation it would be expected that their wells would be affected. Also, the rate of oil discharge from the Ruff Clarkson Steel Company is larger, has been of greater duration (possibly as long as 20 years), and has a possible point of entry to the aquifer through a leaking sewer about 500 feet from the contaminated well. It is not certain how long the sewer has been leaking. If this is the source of the contamination, it likely developed long before the oil appeared in the well. Oil would not be expected to move quickly to the well because a certain degree of oil saturation in the sediments is required before oil can move as a discrete phase.

Since the source of the oil appears to be at least 500 feet from the well, the problem cannot be expected to dissipate rapidly. Pumping of the municipal well will tend to cleanse the aquifer and possibly check the spread of the contaminant. However, there is no assurance that the wells owned by York Farms will not become contaminated at a later date.

RECOMMENDATIONS

(1) The discharge of oil by both Ruff Clarkson Steel Company and York Farms has been terminated and should not be resumed.

(2) Regulations pertaining to waste disposal should be rigidly enforced in this area because the ground water represents a valuable, but vulnerable, resource. In this respect, an assessment of waste disposal practices in the area should be undertaken. Hazardous wastes should not be discharged to the storm sewer system.

(3) The replacement of badly corroded sections of the storm sewers should be considered.

(4) An all-weather skimming separation system should be considered as a semi-permanent part of the reservoir system, as the contamination is not expected to terminate quickly.

(5) Other well owners in the area, particularly York Farms Canning Company, should remain alert to the possibility of oil contamination. In the event of such contamination, it may be necessary to install reservoir systems which would permit the separation of the oil from the water.

All of which is respectfully submitted,

Prepared by: R. J. Patterson, Geologist,
Surveys and Projects Branch.

T. J. Yakutchik
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T. J. Yakutchik, Supervisor,
Surveys and Projects Branch,
Division of Water Resources.

RJP/lb
19/01/72

ONTARIO WATER RESOURCES COMMISSION

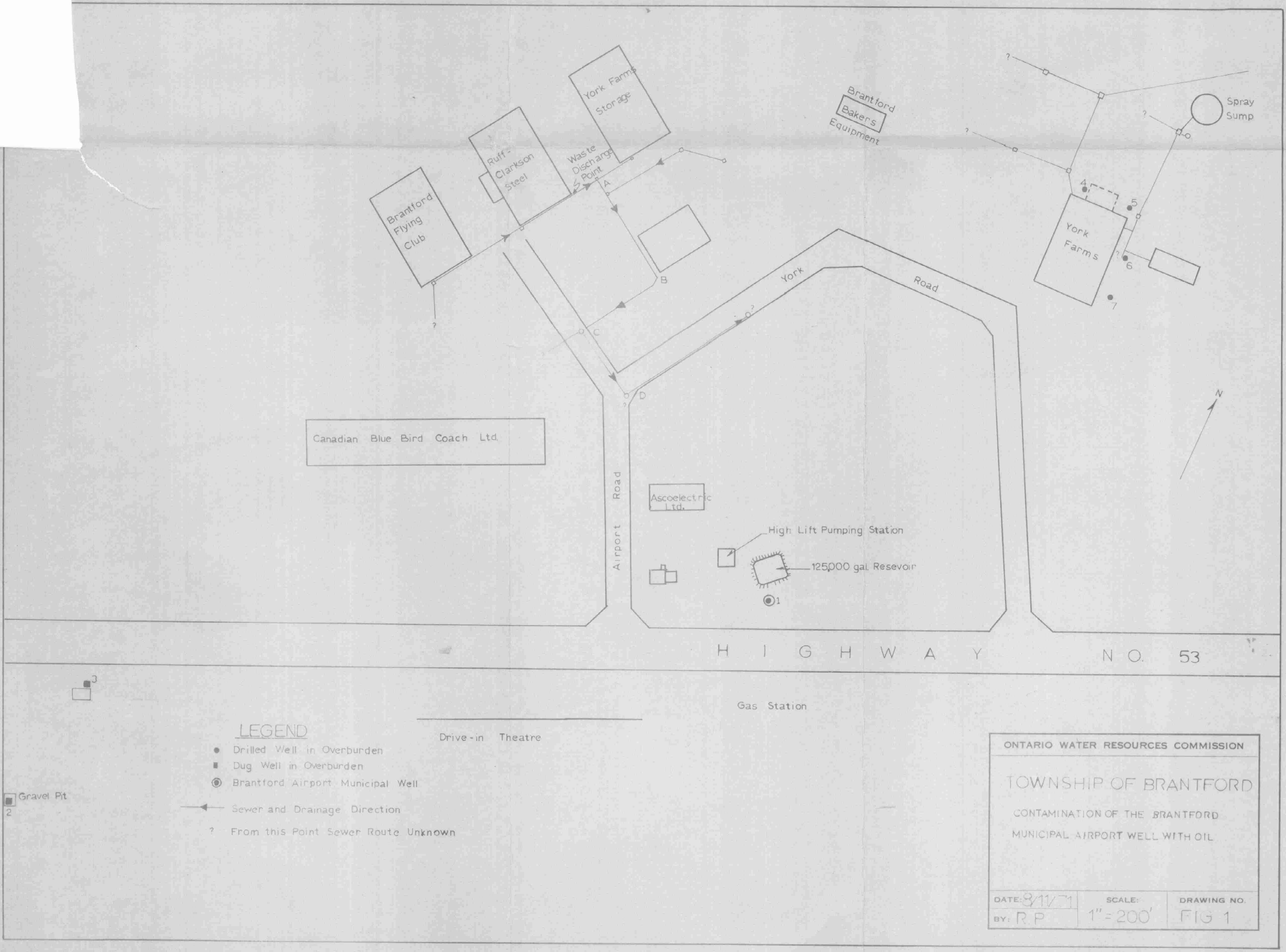
TABLE OF WATER ANALYSES

AREA OF SURVEY BRANTFORD

TABLE 1

DATE JAN. /72

Source and Number	Location and Owner	Date Sampled	Temperature in °F	pH	Mineral Constituents in parts per million (ppm) / equivalents per million (epm)											Alkalinity as ppm $CaCO_3$	Hardness as ppm $CaCO_3$		Total Dissolved Solids in ppm	Specific Conductance (micromhos at 25°C)	[redacted] ETHER EXTRACTION
					Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Carbonate (CO_3)	Bicarbonate (HCO_3)	Sulphate (SO_4)	Chloride (Cl)	Iron (Fe)	Fluoride (F)	Nitrate (NO_3)		Total	Calcium			
WATER IN RESERVOIR	TOWNSHIP OF BRANTFORD	OCT29 1971									63	14			2						<1
2		〃									56	24			5.5						
3		〃									47	155			4.9						
4-7	YORK FARMS	〃									73	21			2.7						



ONTARIO WATER RESOURCES COMMISSION

TOWNSHIP OF BRANTFORD

CONTAMINATION OF THE BRANTFORD
MUNICIPAL AIRPORT WELL WITH OIL

DATE: 8/11/71
BY: R.P
SCALE: 1" = 200'
DRAWING NO. FIG 1